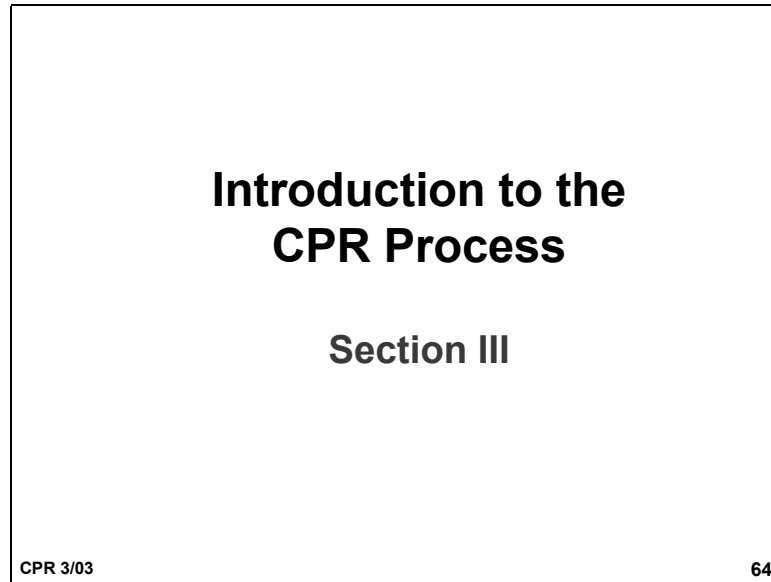



III. INTRODUCTION TO THE CPR PROCESS



A. Overview

Section III, Purpose & Outline



➤ **Purpose**

- Describe the process of establishing a certification basis for a changed product
- Explain how to use Figure 1 of AC 21.101-1

➤ **Outline**

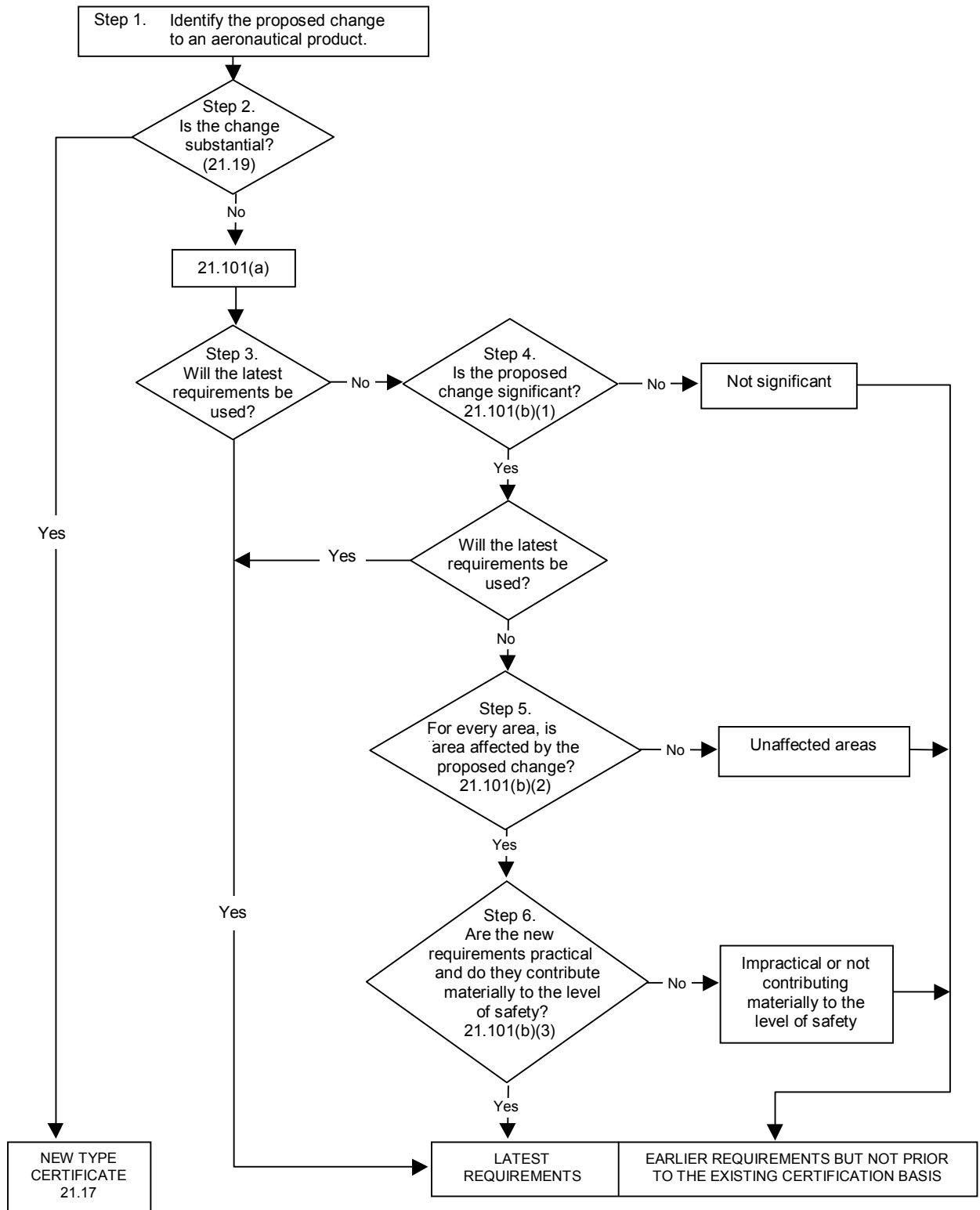
- Introduce process for establishing cert. basis
- Explain steps used to establish cert. basis
- Introduce case study to be used during course

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B. Basic Concepts

- For definitions of terminology used throughout the training refer to section 4 of AC 21.101-1 in Appendix F of your Guide.
- **Figure 1 from AC 21.101-1** shows the process for establishing the certification basis. It is a **WIDE ANGLE VIEW**, not a true flowchart.


AC 21.101-1, Figure 1: Establishing The Certification Basis For Changed Products



C. Steps to Establish the Certification Basis

- Identify the proposed change. – Step 1.

Step 1




- Identify proposed change(s)
 - Identify proposed change within context of its effect on overall product
 - ✓ Assess effects of change on product, rather than on system or component
 - Assure description of change is complete
 - Include previous relevant design changes

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- The applicant must define all the physical and functional aspects of the change. Anything that is not identified as being changed is assumed to be unchanged. The unaffected areas remain at the existing certification basis.

Related Changes

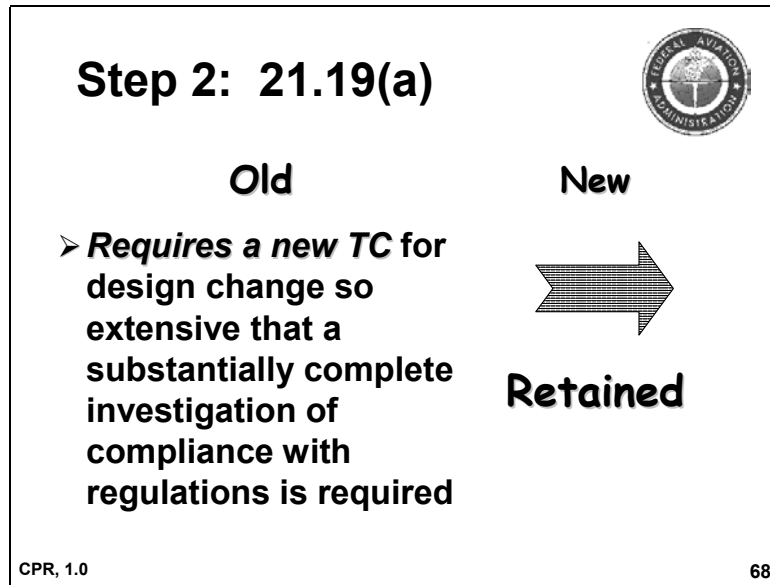


- An applicant may propose several concurrent changes
 - Some may be *significant* at product level
 - Need to determine if proposed changes related
- If changes related, they must be considered together in applying the criteria and making a determination of *significant* or not
- Closely tied to assessment of affected area

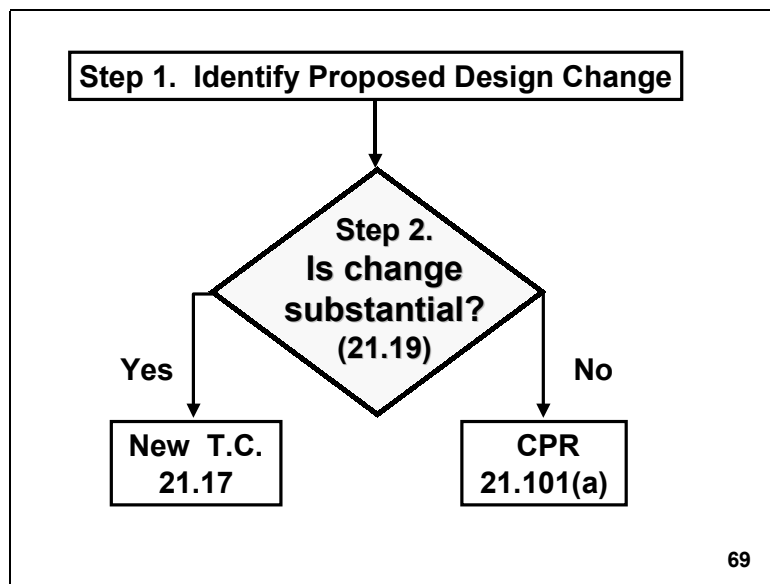
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- Is the Change Substantial? (21.19) – Step 2.



- The more prescriptive provisions of 21.19(b)(c) and (d) have been removed.
- We have identified typical examples of substantial changes in AC 21.101-1, Appendix 1.



Substantial Decisions



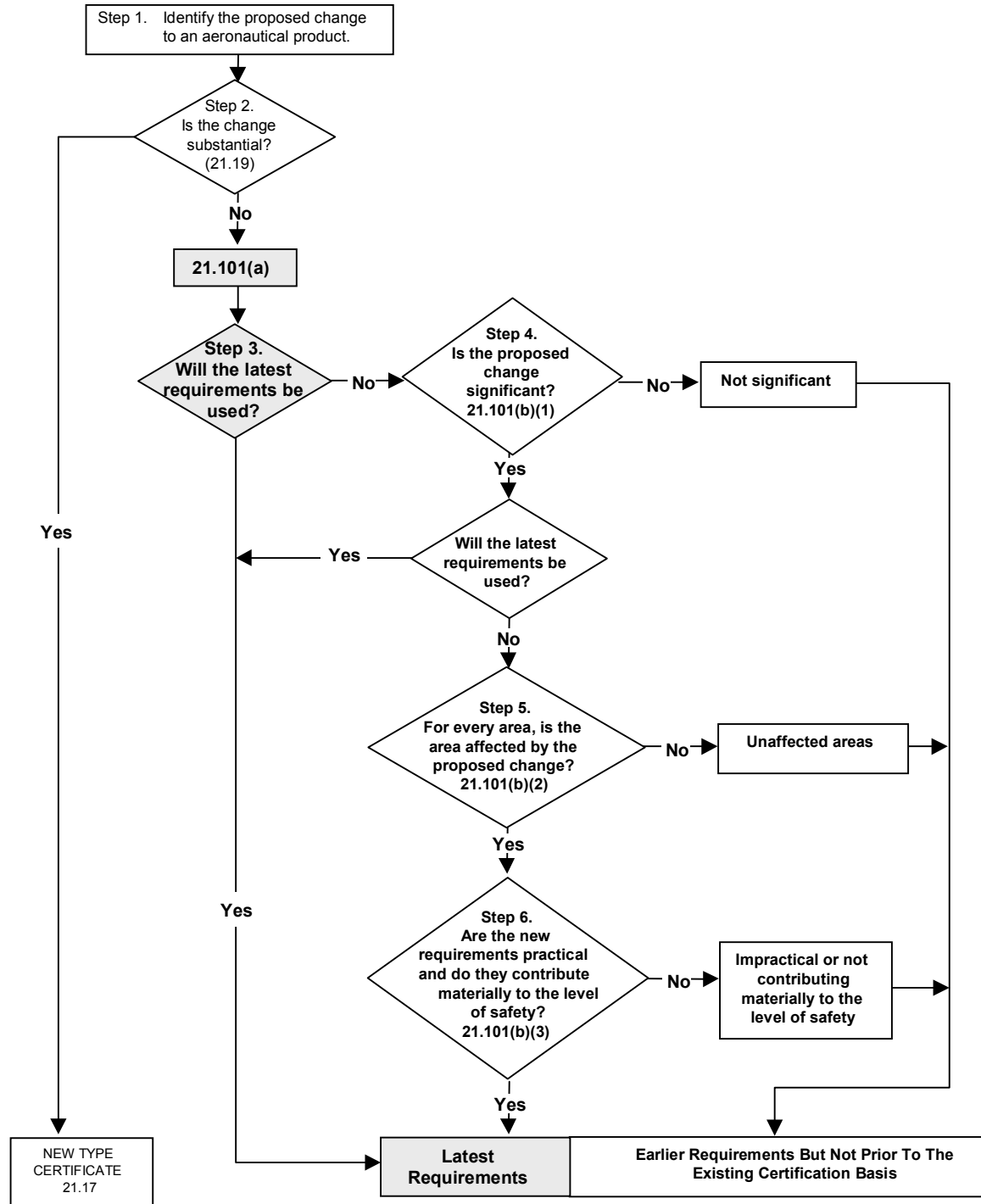
- **If FAA determines change substantial,**
 - Applicant must apply for new TC
 - Certification basis will be regulations in effect on date of TC application
- **If new TC not required in 21.19,**
 - Apply 21.101 to establish certification basis of changed product

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- **Will the Latest Requirements Be Used? [21.101(a)] – Step 3.**
 - The parts of **Figure 1** that relate to section **21.101(a)** are **highlighted** on the next page.

Figure 1, AC 21.101-1, with 14 CFR 21.101(a) Highlighted



Step 3: New 21.101(a)



- **Applicant for a change must show that the changed product complies with the airworthiness requirements in effect on date of application**
- **Exceptions allowed under 21.101(b) or (c)**

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Step 3: 21.101(a)



- **Will the latest requirements be used?**
 - **If YES, may occur for two reasons**
 - ✓ **Applicant elects to comply with latest requirements**
 - ✓ **Applicable requirements haven't changed since previous update of certification basis, so by default product complies with latest regulations**

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Step 3: 21.101(a), cont.

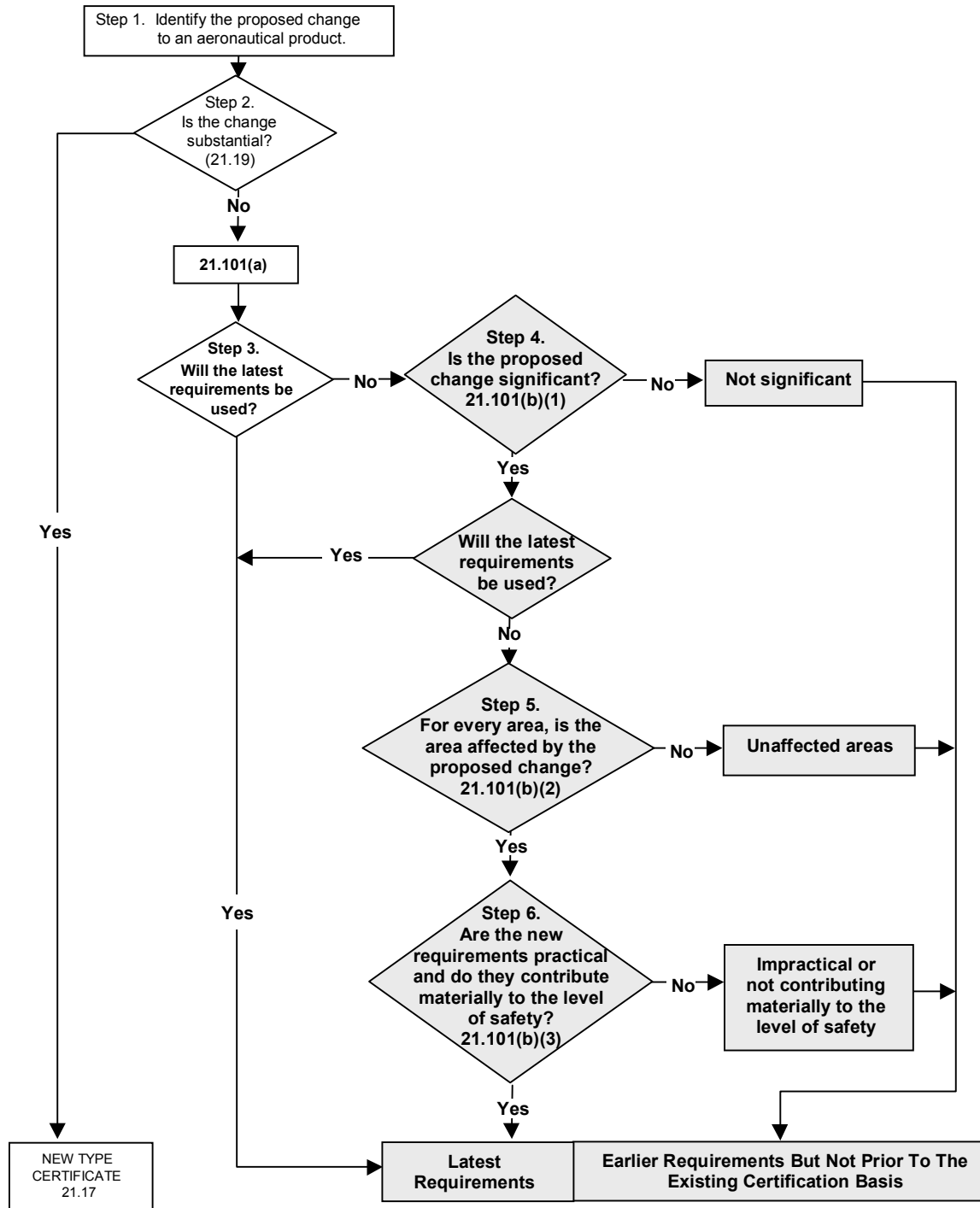
- **Will the latest requirements be used?**
 - If NO, applicant is electing to use the exceptions provided by 21.101(b)
- **Discussion applies to aircraft weighing more than 6,000 lbs. and non-turbine rotorcraft weighing more than 3,000 lbs.**

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- **Designation of Applicable Regulations [21.101(b)(1)(2)(3)].**
 - The parts of **Figure 1** that relate to section **21.101(b)** are highlighted on the next page.

Figure 1 of AC 21.101-1 with 14 CFR 21.101(b) Highlighted



Step 4: 21.101(b)(1)



➤ Is the change *significant* at the product level?

- If *NO*, applicant may comply with regulations in existing certification basis
- If *YES*, applicant must comply with latest regulations
 - ✓ Or choose to apply one of other exceptions

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Step 4: 21.101(b)(1), cont.



- Expect that the hundreds of major product improvement changes made annually will be *not significant* at the product level, so will be approved through the delegation systems
- Remember, minor changes are
- Not significant
 - Approved under 21.95

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Step 5: 21.101(b)(2)

- **All areas physically and functionally affected by the change must comply with the latest regulations**
 - **Unaffected areas remain at the existing certification basis**
- **Identifying the area affected by the change, identifies the regulations that apply to those areas**

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- In **Step 5** we are identifying the areas affected by the change.

Step 6: 21.101(b)(3)

- **Exceptions of *contribution to safety* and *impractical* looked at rule-by-rule**
 - **Applicant may propose alternate approach**
- **All applicants responsible for developing proposal for all exceptions (for non-excepted products)**

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- These two exceptions should be applied in this order. Establish that compliance with the latest regulations would contribute materially to the product's level of safety before examining the practicality of applying those regulations.

21.101 Key Points



- Rule shifts responsibility from FAA to applicant
 - For most products, applicant must now comply with latest regulations for *significant* changes unless they demonstrate one of exceptions exists
 - Exceptions permit the applicant to comply with earlier regulations

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21.101 Key Points, cont.



- Final determination of the certification basis is made by the Administrator
 - FAA may authorize an applicant to make a determination of *not significant* on the Administrator's behalf
 - 21.101 AC and Order provide guidance to aid in making these determinations

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21.101 Key Points, cont.



- **21.101 establishes certification basis for a changed product**
- **21.101 does not excuse applicant from demonstrating compliance**
 - **Applicants must always demonstrate compliance if they make a change, it's just a question of to which rule compliance is being demonstrated**

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D. Case Study: Identification of Change

- The Case Study is detailed on the next page of your Participant Guide.

Case Study: Changed Product for Part 25 Airplane

Product Being Changed: Twin jet engine transport, existing certification basis at Amendment 25-41. Date of application: June, 30, 2003, latest regulations at Amendment 25-109.

Description of Changes in the Application:

I. Lengthen fuselage (same gross weight, trade range for payload)

A. Physical changes

1. Add 10 ft. fuselage plug; total fuselage length is now 80 ft.
2. Extend floor
3. Add two rows of seats
4. Add overhead bins
5. Increase size of cargo compartment by 30%
6. Lengthen control cable runs
7. Extend services (O₂, plumbing, etc.)
8. Increase local skin gauges at wing root

II. Increase engine thrust (to takeoff on shorter runway)

A. Physical changes

1. Increase engine thrust by 3% (9% previous increase without update of the certification basis)
2. Change nacelle cooling flow
3. Redesign pylon to increase strength

III. Landing gear product improvement (no performance credit)

A. Physical changes

1. Brake model revision to prolong life
2. Increase tire plies 16 to 18
3. Change oleo strut orifice
4. Local wing changes at strut attachment

IV. Flight deck avionics update

A. Physical changes

1. Add a new Electronic Flight Information System (EFIS) that displays critical engine parameters, and warning and advisory information to the crew
2. Revise the Flight Management System (FMS) to incorporate software updates
3. Minimal changes to the overall configuration of the current system – only those changes necessary to accommodate new EFIS

Case Study Overview



➤ **Manufacturer of twin-engine jet transport category aircraft identified four changes:**

- **Lengthening the fuselage,**
- **Increasing the engine thrust,**
- **Improving the landing gear, and**
- **Updating the avionics systems**

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Case Study Overview, cont.



- **Existing certification basis is at amendment 25-41**
- **Date of application is June 30, 2003**
- **Latest regulations are at amendment 25-109**

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 **Case Study, Step 1**

- **Identify change in context of its effect on the entire product**
 - **Trading range for payload – no gross weight increase**
 - **Thrust increase being made to permit takeoff from shorter runways**
 - **Changes to landing gear made as product improvement**

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 **Case Study, Step 1, cont.**

- **Include all previous relevant design changes**
 - **Applicant acknowledged several previous thrust increases (total of 9% previous increases without update of the certification basis)**

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**Case Study, Step 1, cont.**

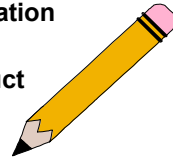
- **Determine if proposed changes are physically or functionally related**
 - Fuselage plug, engine thrust increase, landing gear change, and flight deck update affect different areas of the aircraft
 - They are NOT physically related

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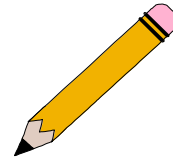
**Case Study, Step 1, cont.**

- **Are the changes related through their effects on the aircraft's functional characteristics?**
- **Are the thrust increase and the landing gear changes related to lengthening the fuselage?**
 - Applicant trading range for payload; no increase in aircraft's gross weight
 - Thrust bump proposed to permit operation from shorter runway
 - Landing gear changes made for product improvement



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 **Case Study, Step 1, cont.****➤ Decision**

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Modified Scenario

- **Same proposed changes, except with gross weight increase**
 - Thrust increase and landing gear changes may be necessary to accommodate increased weight
 - Landing gear changes may be required to meet stopping distance, kinetic energy absorption, or heat release rate requirements at increased weight
 - If changes related, consider them as a unit when determining if *not significant* at product level

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E. Summary

Summary Questions



- **Why is it important to identify related changes?**

- **What, if any, changes are there in the process of finding if the design change is substantial?**

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Summary Questions, cont.



- **What are the four exceptions?**

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Summary Questions, cont.



- **When will the latest requirements be used?**

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Section III, Summary



- **Wide-angle view of process for establishing certification basis of a changed product**
- **Brief overview of steps in the process, concentrating on Steps 1 – 3, as remainder of course will focus on remaining steps**

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Section III, Summary, cont.



➤ Introduced Case Study

- **Identified four changes to product**
- **Determined changes not related, so each change will be considered independently**